thermamed *smart**care***
Patient Warming System

Service Manual

Rescue System

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Introduction

Maintenance must be carried out in accordance with EN 60601-1 and is prescribed every 2 years for medical appliances. Calibration work may only be done with the calibration kit supplied by thermamed *smart***care** GmbH. Use only original replacement parts. Maintenance may only be carried out by trained and authorised persons.

Attention: The prescribed test of electrical safety according to EN 750 / EN 751 has to be carried out irrespective of this Service Manual. Therefore observe your country's laws.

Visual check

Segments

Check all segments, including all cables and connectors, for mechanical damage.

In particular:

- Check the segments for holes and tears.
- Check the cables for breaks in the sheaths and cable strain relief devices.
- Check the connectors for corrosion and mechanical stability.

If a segment has at least one of the defects described above, send it to thermamed *smart***care** GmbH for repairs.

Control units:

Check the housing of the control unit for mechanical damage (cracks and holes) and check the mechanical function of the pushbuttons.

Replace faulty housings, front overlay, display discs and holders; see section **Repairs**

If one of the pushbuttons is mechanically defective, send the control unit to thermamed *smart***care** GmbH for repairs.

Switch the appliance on and check that the control unit starts correctly.

Sequence after the ON switch of the control unit is pressed:

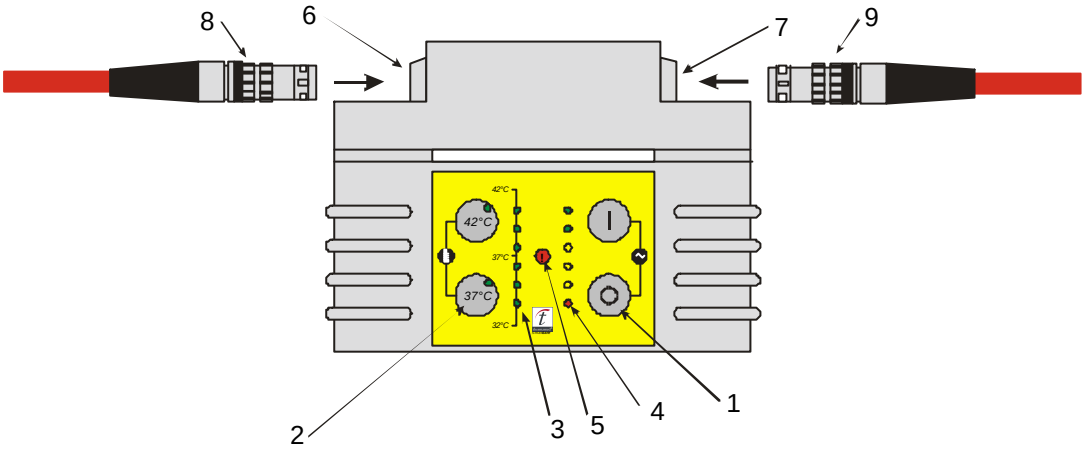
- Brief acoustic signal
- All LEDs flash up for 2 sec
- The green LEDs of the temperature display run through
- Double click of the safety-relay can be heard
- LED Column (4) shows battery voltage / vehicle network voltage
- LED Column (3) shows the actual blanket temperature

The sequence is finished when the LED at the 37°C button is shinning. The blanket temperature is preset to 37°C.

If the control unit does not carry out the start procedure correctly, send it to thermamed *smart***care** GmbH with a description of the fault for further checks.

The calibration kit contains:

- **Software package**
- **Connection cable [PC –control unit]**
- **Adapter for Calibration box [temperature defaults]**
- **Tweezers for replacing the ICs**



1.) On/Off switch: (I = On, 0 = Off)

2.) Temperature setting: (37°C + 42°C)

3.) Actual temperature display / Fault code display (32°C to 42°C)

4.) Battery status display

5.) Fault display (LED)

6.) Socket for rescue blanket (yellow)

7.) Socket for supply voltage (blue)

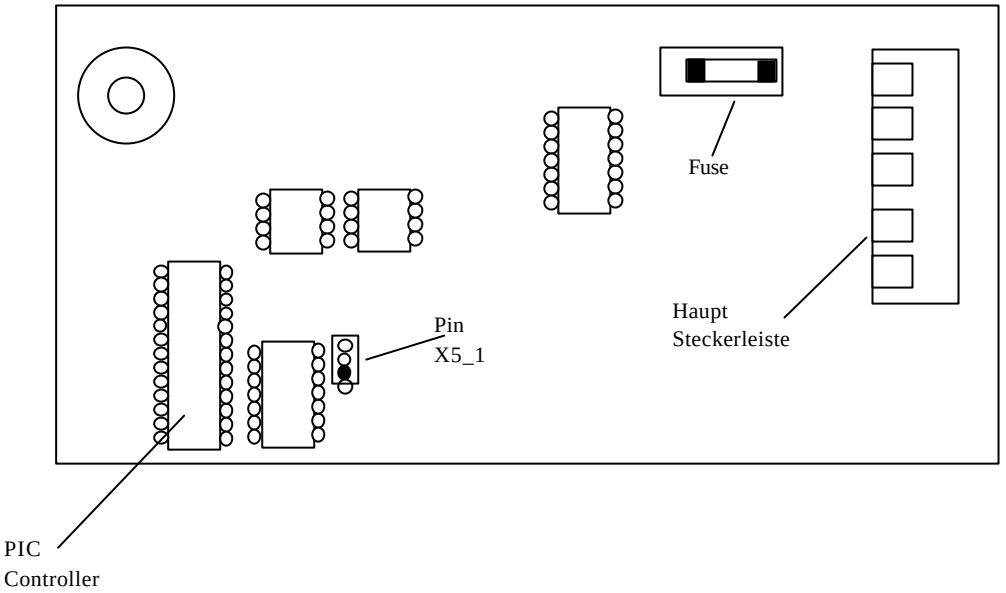
8.) Connector for the rescue blanket (yellow)

9.) Connector the supply voltage (blue)

Calibration and software updates

Note: see the chapter in the annex for the installation of the HDS_MESS calibration software!

Unscrew and remove the four screws on the rear to open the control unit. You can now remove the rear.



Place the plug for connecting the PC to the CPU on terminal X5_1 so that the cable marked black is placed on the second pin from the bottom (see sketch).

Note: Wrong placed connection cables can cause the destruction of the controller.

You can now start the HDS_MESS software. Furthermore the controller must be connected with the supply voltage.

Note: Do not switch on the controller!

The control unit may report one or more faults after being switched on. Cancel these faults by clicking the button RESET ERROR.

Use the command READ EPROM to display the EPROM's basic settings on the PC. The control unit is then recalibrated. Carry out the following steps in the order shown:

- Set the rotary switch on the calibrating box to 30°C and connect to the control unit's yellow output socket. Always use the delivered Adapter Cable.
- Set the GAIN fields to zero.
- Adjust OFFSET so that both channels show 30°C.
- Set the rotary switch on the calibrating box to 45°C and adjust GAIN so that the PC displays the temperature 45°C.
- Check the other temperatures by means of appropriate settings at the calibration box.

If a temperature does not fit, set the box to 45°C again and alter the GAIN setting by one step. Now repeat the temperature check.

Once you have calibrated all channels, end the procedure by clicking the SAVE EPROM button. Then click the SOFT RESET button and the control unit starts again.

Checking the resistance values of carbon fibres (optional)

The HDS_MESS software is used here as well. Remove the control unit from the housing and connect it to the PC as described above.

Instead of the calibration box, connect a warming segment to the control unit's yellow output. Switch on the controller and take care that it is in normal mode. You can now read off the output voltage and the output current on the PC; calculate the resistance using Ohm's law:

U/I = R

Assembling the control unit

Remove the Adapter Cable. Use the four fastening screws to fix the rear. (Do not forget the seal!)

Repairs

Only the repairs described here may be carried out. All other repairs to the control unit and the warming segments must be carried out by thermamed *smart***care** GmbH.

Changing the appliance's fuse

Remove the rear cover and change the fuse. Only use fuses with the same values as the original.

Replacing the appliance's seals

Remove the rear cover and exchange the seal

List of Replacement parts:

On request

Annex

Installing the program HDS_Mess

Insert the CD, start Set-up and follow the prompts on the screen.

Configuration of the program HDS_Mess

After the installation, the program must be configured for the PC: to do this, start the program and double-click on the button CONFIG RS 232 to open the configuration routine; make the following settings:

Button	Setting	Default setting
COM port	Select the COM port for the interface	
Baud pate	Select transmission speed	9600
Parity	Parity bit setting	none
Data bits	No. of data bits	8
Stop bits	No. of stop bits	1
Input Quere Size		512
Output Quere Size		512
Set CTS mode		Off
Set XON/XOFF		Off
Timeout	Waiting time	5

Fault messages

! **Important: this list can only be used as a starting point. Because many of the faults listed here affect each other there is no guarantee that the cause of the fault can be determined exactly.**

Display	Problem	Possible fault	Remedy
	Control unit cannot be switched on	Vehicle network connector not plugged in	Plug vehicle network connector in
		Fuse triggered	Replace fuse. (If this occurs again, have a technician check the unit). The fuses are in the control unit and, with standard vehicle network connectors, in the connector as well.
	Blanket/bag does not warm up	Blanket/bag wrong way round	Turn the blanket/bag the right way round.
	Blanket/bag too warm	Setpoint temperature set too high	Reduce setpoint temperature
		Objects on the blanket/bag causing heat build-up	Remove the objects from the blanket/bag.
	When the blanket/bag is disconnected from the control unit a fault message is displayed and the safety cut-off is activated.	Blanket/bag still switched on	Switch the blanket/bag off before pulling the connector out.
LED 2	Fault no. 2	Blanket/bag defective	Replace the blanket/bag, inform service quoting the fault code.
LED 1 and 2	Fault no. 3	Blanket/bag defective	Replace the blanket/bag, inform service quoting the fault code.
LED 2 and 3	Fault no. 6	Input voltage too high	Use only power supply units that correspond to the stated operating voltage.
LED 1, 2 and 3	Fault no. 7	Input voltage too low	Use only power supply units that correspond to the stated operating voltage. If using with a battery, the battery is probably completely discharged; replace with a charged battery.
LED 4	Fault no. 11	Connected blanket/bag is too cold	See information at the end of the table.
and 1 and 2		Defective thermo sensor	Replace the blanket/bag, inform service quoting the fault code.
LED 3 and 4	Fault no. 12	Excess temperature	Let the blanket/bag cool down, smooth the blanket out; if this problem occurs again, shut the complete system down and inform service quoting the fault code.
LED 1, 3 and 4	Fault no. 13	Excess temperature	Let the blanket/bag cool down, smooth the blanket out; if this problem occurs again, shut the complete system down and inform service quoting the fault code.
LED 2, 3 and 4	Fault no. 14	Excess temperature	Let the blanket/bag cool down, smooth the blanket out; if this problem occurs again, shut the complete system down and inform service quoting the fault code.
LED 1, 2, 3 and 4	Fault no. 15	Control unit defective	Replace the control unit, inform service quoting the fault code.
	Control unit no longer working and shows a fault message	Safety cut-off activated by a fault	The control unit cannot be restarted until after you have switched it off.

Reservation of the RS 232 interface: